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NEUROPTEROID INSECTS FROM FORMOSA

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THREE PLATES

In 1934 Mr. J. Linsley Gressitt collected a fair number of neuropteroid insects on Formosa. Dr. R. Takahashi has sent me for study his collection of Formosan Psocidæ. These collections form the basis of the following account.

Few collections of these insects have been made on the island. Over twenty years ago Sauter collected insects in the southern part of the island. His material in this group was reported upon by Klapalek, Enderlein, and Petersen. Okamoto and Nakahara have described several species in their papers on these insects of the Japanese Empire. Later Issiki published a large paper on the Panorpidæ.

It is at once noticeable that with these insects, as with others, the island shows great affinity to the Asiatic mainland, particularly the highlands. There are, it is true, a few species widely spread in the Malay region and even to the Philippines, but, as a rule, the species and many genera are different from those of the Philippines. The numerous Panorpidæ, the large sialids, and the *Raphidia* species, as well as the bulk of the Perlidæ, are entirely foreign to the Philippines.

To Japan proper there is much more affinity, although the island is three times as far from Japan as it is from the Philippines. Most of the genera and a number of the species are the same as those of Japan, fully as great a proportion as in adjacent China.

I have included a few species taken in the Loochoo Islands, northeast of Formosa.

A set of the Psocidæ has been returned to Dr. R. Takahashi; the rest of the material is in the Museum of Comparative Zoölogy.

PSOCIDÆ

Genus ISOPHANES novum

Wings of the texture and appearance of *Calopsocus*, being concave and the tip bent down; the surface of the forewing is roughened in only a few places and then less strongly than in *Calopsocus*. The forewing has the long discoidal cell as in that genus, but the cubitus has not the long fork and there is no trace of the irregular venation characteristic of *Calopsocus*. There are but three branches of medius beyond the cell (four in *Psocus*); the stigma is like some species of *Psocus*, strongly angulate behind, and in one species (*P. palliatus* Hagen) there is a very distinct process to the angle; in the hind wing the medius is not forked.

Type of the genus, *I. decipiens* sp. nov.

I include also *Psocus palliatus* Hagen. The genus is an offshoot of *Calopsocus*, differing principally in the more regular venation.

ISOPHANES DECIPIENS sp. nov.

Head reddish, labrum brown, nasus darkened, as also the vertex, in alcohol the head is pale yellow; vertex almost as sharp as in *Calopsocus*, distinctly bilobed; antennæ pale on base, black beyond (in alcohol pale), moderately hairy. Thorax above yellowish, pleura darkened; legs pale, tips of tibiæ and tarsi dark, hind femora dark, abdomen pale. Head structure as in *Calopsocus infelix*. Forewing with short hairs on veins as in *Calopsocus*, those on basal costal edge also short. Membrane fairly shining and wholly dark brown; hind wing fumose, with darker veins.

Venation as figured, discal cell long, no fork to cubitus, no trace of irregular venation, stigma strongly angulate behind, but no process. Condition of medius and radial sector at the connection variable, sometimes just touching at one point, sometimes united for a very short distance, and in one specimen with a very short crossvein.

Length, 4 to 4.5 mm.

FORMOSA, Hassenzan, June 26; Sakahen, July 13; Bukai, June 13 and 14; Urai, May 1 (*Gressitt*); Taihoku, May 14 (*Takahashi*). Type, M. C. Z. No. 21757; paratype in Takahashi collection.

Isophanes palliatus Hagen (*Psocus*) is a smaller species, with darker head and thorax and pale antennæ, the stigma has a very distinct process from the angle behind.

PSOCUS TOKYOENSIS Enderlein.

FORMOSA, Rokki, May 13 to 26; Chipon, April 18; Musha, May 20; Taihoku, May 22 and July 17; Hassenzan, June 23 to 27; Kuraru, April 11, May 4, and June 3 to 9. LOOCHOO ISLANDS, Iriomote Island, July 1 (*Gressitt and Takahashi*).

Psocus capitatus Okam. is but a variation of this species.

PSOCUS FORMUSANUS Okamoto.

FORMOSA, Kuraru, June 3 to 9; Hori, July 5 to 9; Masha, May 20; Hassenzan, June 27 (*Gressitt*).

PSOCUS SEXPUNCTATUS Linnaeus.

FORMOSA, Hori, July 5 to 9; Musha, May 21; Suisha, June 1 (*Gressitt*).

PSOCUS FILICORNIS Enderlein.

I identify four females from Rokki, May 13 to 26; Kuraru, May 7; Kanshrei, April 18; and Arisan, July 5 (*Gressitt and Takahashi*), as probably this species described from Singapore and based on males. These specimens are closely related to *P. longicornis*; one specimen has about the basal one-tenth of wing black, the others scarcely show it (in males the basal fifth is black); otherwise the wing is clear except the black stigma. In all four the areola postica is very narrow above, almost pointed; Enderlein does not mention this; the European *P. longicornis* has a broad top to areola postica.

PSOCUS OBSITUS Enderlein.

Hassenzan, June 26; Hori, July 8 and 9 (*Gressitt*).

PSOCUS SAUTERI Enderlein.

Hassenzan, June 22 to 27; Bukai, June 14 (*Gressitt*).

AMPHIGERONTIA JEZOENSIS Okamoto.

FORMOSA, Kanshrei, April 19. LOOCHOO ISLANDS, Iriomote Island, July 1 (*Gressitt and Takahashi*).

SIGMATONEURA SINGULARIS Okamoto.

Kuraru, June 3 to 9; Shonoryo, June 11; Shirin, October 11 (*Gressitt and Takahashi*).

COPOSTIGMA HYALINA Okamoto.

Kuraru, May 5 (*Gressitt*).

TÆNIOSTIGMA INGENS Enderlein.

FORMOSA, Hassenzan, June 23 to 27; Arisan, July 5; Kanshrei, April 18; Kuraru, June 3 to 9; Suisha, June 2; Shonoryo, June 11; Taihoku, June 29. CHINA, Foochow, August 3 (*Gressitt and Takahashi*).

KODEMAIUS BREVICORNIS Okamoto.

Taihoku, March 27 to April 25; Taiheizan, May 8; Kuraru, May 5; Mareppa, August 10; Hassenzan, June 27 (*Gressitt and Takahashi*).

The female is much larger and darker than the male, with eyes wide apart, but still very prominent.

LOPHOPTERYGELLA CAMELINA Enderlein.

Taihoku, May 22 and July 18; Kagi, April 24; Keelung, July 31 (*Takahashi*).

Genus STENOPSOCUS Hagen

Of the four species of this genus, one agrees with the common Japanese form and the others are new with a more angulate stigma than that in the Japanese species. The venation is about the same, with frequent variations in length of forks, and in one case with an extra fork to the radial sector.

Key to the species of Stenopsocus.

1. Head pale, with a median black stripe from vertex through ocelli and over nasus, clypeus somewhat darkened, femora yellowish, in males the tibia nearly black, stigma slender, dark behind, not as wide as length of the crossvein; basal joint of antennæ pale..... *aphidiformis*.
Head largely black, with more or less evident pale spot in middle of vertex; clypeus pale 2.
2. Pterostigma yellow, bordered with black only on the outer part of hind margin, legs wholly pale; basal joint of antennæ partly pale.
externus.
Pterostigma marked with dark all along the hind margin; basal joint of antennæ black 3.
3. Hind tibiæ black in both sexes; stigma plainly angulate behind; thorax scarcely pale in the middle..... *tibialis*.
Hind tibiæ pale (as rest of legs); stigma but little angulate behind; thorax pale in middle..... *formosanus*.

STENOPSOCUS APHIDIFORMIS Enderlein.

Bukai, June 13 and 14; Rokki, May 13 to 26; Hassenzan, June 22 to 27; Musha, May 20 and 21; Arisan, June 6 and 7; Sakahen, June 16 (*Gressitt*).

STENOPSOCUS FORMOSANUS sp. nov.

Head black, shining, a large transverse yellowish or whitish spot on vertex, clypeus very pale; antennæ wholly black; thoracic notum black, with a pale median stripe between black lateral lobes; pleura black; abdomen dark on base, beyond pale as also venter, tip black; legs pale, knees darker as also tips of hind tibiæ and tips of all tarsi. Wings hyaline, venation brownish, radius brown to deep black, in several females a large, elongate, dark spot over origin of radial sector; stigma yellow, its hind margin bordered with black along entire length and extending down on crossvein, stigma here scarcely as wide as length of crossvein, and crossvein about as near to tip as to base and scarcely oblique; angulation of stigma fairly prominent.

Length to tip of wing, 5.5 to 6 mm.

FORMOSA, Hassenzan, June 22, 25, and 26; Arisan, May 27 and June 6 (*Gressitt*). Type, M. C. Z. No. 21760.

STENOPSOCUS TIBIALIS sp. nov.

Head black, clypeus very pale, pale median spot on vertex not so very distinct; antennæ wholly deep black; thoracic notum black; a median rather yellowish area, pleura black; abdomen dark at tip; legs largely pale, but hind tibiæ wholly black. Wings hyaline, veins rather pale, radius brown, sometimes slightly margined; stigma yellow, its posterior margin bordered with deep brown and extending down on crossvein, stigma plainly angulate at crossvein and here as broad as length of crossvein, crossvein at about middle of length and slightly oblique.

Length to tip of wing, 5.5 to 6 mm.

FORMOSA, Arisan, May 24 and 29; June 2 and 7; Taiheizan, May 8 (*Gressitt*); Arizan, April 22 (*Takahashi*). Type, M. C. Z. No. 21759; paratype in Takahashi collection.

STENOPSOCUS EXTERNUS sp. nov.

Head black, shining, a large transverse pale spot on vertex, clypeus pale; antennæ deep black, basal joint partly pale, especially below, thorax black, a small, faint, pale, median area; pleura mostly dark; abdomen pale, dark at tip; legs pale, tips of tarsi darker. Wings hyaline, veins pale, radius brownish; stigma clear yellow, its posterior external edge broadly bordered with deep black as far as crossvein; stigma angulate behind at crossvein and here plainly broader than the length of the crossvein, this crossvein nearer to base of stigma than to apex, and scarcely oblique.

Length to tip of wings, 5 mm.

FORMOSA, Taihoku, May 5; Arisan, May 29 (*Gressitt*) and April 19 (*Takahashi*). Type, M. C. Z. No. 21758; paratype in *Takahashi* collection.

MATSUMURAIELLA ENDERLEINI sp. nov.

This is very close to *M. radiopicta* Endl. and perhaps is but a subspecies or race of it.

Both of my Japanese specimens agree with Enderlein's figure in having the branches of the radial sector widely divergent at the tips, so that the space is wider than that from the first branch to the stigma or from the second branch to the medius. In the four Formosa specimens the branches of the radial sector are much more parallel, so that the space between them at the tip is hardly as wide as that from the first branch to the stigma or from the second to the medius; in fact the radial sector and the medius lie rather nearer together, in one wing the lower branch of the radial sector touching the medius.

The principal difference, however, is that the hair on the head and thorax is about twice as long as in the Japanese specimens, and very dense, white on the head, black on the thorax; the wings are also more hairy and with longer hairs on the base.

The venation in both forms is variable as to the areola postica; in one Japanese specimen it just fails to reach the medius, and in some Formosa specimens barely reaches it; in none is it as long as in Enderlein's figure.

Length of forewing, 4.5 to 5 mm.

FORMOSA, Hori, May 25; Taiheizan, July 3; Arisan, June 4; Hassenzan, June 26 (*Gressitt*); Taichu, April 18 (*Takahashi*). Type, M. C. Z. No. 21756; paratype in *Takahashi* collection.

HEMIPSOCUS CHLOROTICUS Hagen.

Taihoku, June 4 (*Takahashi*).

AMPHIPSOCUS FORMOSANUS Okamoto.

FORMOSA, Chirifu, May 18; Sakahen, June 16 and July 13; Bukai, June 11 to 14; Hassenzan, June 22 to 27; Arisan, May 23 and 26; Suisha, June 2; Taiheizan, July 7 (*Gressitt*). CHINA, Foochow, August 3 (*Gressitt*). Very common. The male has the stigma almost wholly bright reddish, and a dark band from eye to eye. In two males from Arisan the areola postica is longer than high; in one wing of one specimen it is connected by a crossvein to the medius.

DYPSOCUS TAPPANENSIS Okamoto.

Urai, April 2; Shinten, April 2; Hakumo, November 1; Suisha, May 31 and June 1; Hassenzan, June 20 to 27 (*Gressitt and Takahashi*).

KOLBEA SERIALIS sp. nov.

Head pale, mottled with brown, five oblique brown lines each side between antennæ, ocelli on black spots, a brown spot in middle of the vertex and several smaller brown spots on each side; some erect long hairs on vertex; antennæ pale, slightly marked with brown, with rather sparse but very long hair.

Thorax dark, with small pale spots and lines; abdomen dark at base and at tip; legs pale, tibiæ with two dark bands.

Forewings hyaline, radius, medius, cubitus, and second anal to about middle of wing pale with dark spots, other veins dark; a dark spot at tip of each outer vein, base and apex as well as hind margin of stigma broadly dark, white in the middle, a faint dark cloud behind angle of stigma, and also in fork of radial sector and medius; a series of seven small brown spots subapically, one in each of the apical cells to and including the areola postica; hind wings pale, veins brown.

Stigma very large and strongly angulate behind, areola postica also very large, but a little longer than high.

Length, 3 mm.

FORMOSA, Chirifu, May 19 (*Gressitt*). Type, M. C. Z. No. 21762.

KOLBEA FUSCONERVOSA Enderlein.

Hassenzan, June 21 to 27; Musha, May 21; Hori, June 8 and 19; Sakahen, June 16 and July 13.

Enderlein says thorax "rostgelb," Okamoto, "rostgelblich." I have one discolored specimen which is so, but all the many others have three large black spots on the thorax; the one on anterior lobe is often divided by a narrow pale line; the principal veins are dark, sometimes very dark.

CÆCILIOUS ARIDUS Hagen.

Taihoku, December 15, on bamboo; Suisha, June 2; Karenko, August 22; Arisan, May 24; Hassenzan, June 22 to 27.

CÆCILIOUS PODACROMELAS Enderlein.

Taiheizan, May 8; Shikayan, May 12; Pianan, May 11; Arisan, May 24 and July 5; Taihoku, April 23 (*Gressitt and Takahashi*).

In one specimen one wing has a crossvein from areola postica to the medius.

CÆCILIUS OKAMOTOI nom. nov.

This is the *C. annulicornis* of Okamoto, which is preoccupied by Enderlein's name.

Riran, April 19 (*Gressitt*).

CÆCILIUS STIGMATUS Okamoto.

Bukai, June 13 and 14; Arisan, May 29, June 4 to 7; Hassenzan, June 22 to 27 (*Gressitt*). This small, dark-winged species has a pale area behind stigma, a white spot at base of areola postica, a white dot at nodus, and a whitish patch at base of stigma.

CÆCILIUS JAPANUS Enderlein.

Taiheizan, May 7; Kuraru, April 7; Bukai, June 13 and 14; Taihoku, December 18 (*Gressitt and Takahashi*).

CÆCILIUS FLAVIDORSALIS Okamoto.

Toran, May 23; Shinten, April 13 (*Gressitt and Takahashi*).

CÆCILIUS GONOSTIGMA Enderlein.

Urai, May 1; Taihoku, March (*Gressitt and Takahashi*).

CÆCILIUS FRATERNUS sp. nov.

Head yellowish brown, nasus and labrum dark, both rather brassy, clothed with erect pale hairs; palpi and antennæ pale, latter with only moderately long hairs; thorax black, with short erect hair; abdomen pale brown, darker at tip; legs pale, unmarked. Forewing almost wholly brown, markings very similar to those of the figure of *C. himalayanus* Endl. Base of areola postica pale as in that species, very dark oblique mark on stigma reaching back, clear space behind stigma including the outer radial cell; wing darkest near middle of costal area and along outer margin as in *C. himalayanus*, but it differs in that the entire basal part of the stigma is snow white; the venation is the same, except that the cubitus is plainly a little sinuous. The stigma is angulate behind. Hind wings very faintly infusate, tips scarcely darker.

Length, 4 mm.

FORMOSA, Hori, July 5 to 9 (*Gressitt*). Type, M. C. Z. No. 21767.

CÆCILIUS MUGGENBURGI Enderlein.

Kuraru, May 5, June 3 to 9; Arisan, May 26; Taiheizan, July 7; Hassenzan, June 22. A widely distributed species.

CÆCILIUS DOLOBRATUS Hagen.

FORMOSA, Hori, June 9; Musha, May 20; Taihoku, March 14. LOOCHOO ISLANDS, Iriomote Island, July 19 and 25 (*Gressitt and Takahashi*).

Described by Hagen from Ceylon, also occurs in Singapore. Of the form of *C. muggenburgi*, it has two dark lines extending in front of the dark streak; one of these crosses the yellow stigma, the other borders the upper branch of the radial sector; the dark streak on outer part of wing reaches to the hind border; in middle of hind margin a wide hyaline area, but the base is largely dark; the hind wing is fumose except the outer costal part which is hyaline. The stigma is elongate, more swollen behind than in *muggenburgi*, but not angulate, the areola postica is short and quite high, larger than in *muggenburgi*. Enderlein puts it in a new genus, *Coryphosmila*.

CÆCILIUS CONFUSUS sp. nov.

Head and thorax largely deep jet black; antennæ pale on base, beyond black; abdomen brownish; legs very pale, almost white, very slender. Forewings hyaline, with a brown streak through to tip, at tip breaking up into three parts, one along each branch of radial sector, and a broader one over medius and its upper branch; hinder half of median cells clear to base of areola postica, from here the brown connects to the middle streak; basally the brown not as dark; cubitus and radial sector darkest; upper branch of radial sector curves up more than in allied forms, becoming almost transverse; stigma scarcely yellowish, moderately swollen behind, more so than in *C. muggenburgi*, but not at all angulate behind; space between medius and radial sector about as wide as in *C. muggenburgi*; areola postica larger than in that species. Hind wings fumose, with the outer costal area clear as in *C. dolobratius*.

Length, 4 mm.

FORMOSA, Arisan, May 24 and June 4 (*Gressitt*). Type, M. C. Z. No. 21768.

Differs from *tenuicornis* Karny in having radial sector and medius united for a longer distance and in lower areola postica.

CÆCILIUS SIMILARIS sp. nov.

Resembles *C. dolobratius* and *C. muggenburgi* in having a dark streak through middle of wing. It differs from *muggenburgi* in having a stigma angularly widened behind and with a dark spot to the streak, and first the branch of the radial sector bordered with dark, the outer hind border of the stigma is

sometimes dark. The dark streak is not straight, but in basal half of wing is nearer to costa, and at the connections it bends down and runs out to the tip of the wing from the median vein up to above the radial sector, leaving the apical part of the outer radial cell clear; all the space behind medius is likewise clear, and the medial cell is mostly clear or nearly so, but the cubitus and the base of the radial sector are black-bordered.

Hind wings with surface fumose, except outer costal area, just as in *dolobratus*. First branch of radial sector very oblique and parallel to outer border of stigma. Areola postica (which is clear) of moderate size, plainly longer than high, but reaching more than one-half way to medius. Medius and radial sector, when separating, leave a very broad space, especially near base, very much broader than in *dolobratus*, in which these two veins are rather close together.

Length, 4.5 mm.

FORMOSA, Arisan, May 24 and June 7; Taiheizan, July 7 (*Gressitt*). Type, M. C. Z. No. 21769.

This species is near to the European *C. fuscopterus*, but in that species the dark streak extends farther behind and occupies all of discoidal cell and most of the basal part of wing; the mark at the angle of the stigma is not so dark, and the medius and the radial sector lie closer together than in that species.

These four allied species of *Cæcilius*, each with a longitudinal dark stripe through the wing, can be tabulated as follows:

Key to four species of Cæcilius.

1. Median cells practically entirely dark; a dark mark from the dark streak up across the yellow stigma, latter swollen but hardly angulate behind; first branch of radial sector bordered with dark.... *dolobratus*.
Outer median cells largely clear; no dark mark reaching across stigma. 2.
2. First branch of radial sector not bordered, no mark from dark streak towards stigma, latter elongate and very low, scarcely swollen behind. *muggenburgi*. 3.
3. First branch of radial sector bordered with dark..... 3.
3. Stigma angulate behind, with a very dark spot from the angle to the streak; first branch of radial sector very oblique..... *similaris*.
Stigma rounded behind; no spot from stigma to streak, first branch of radial sector bending up so as to be more transverse, both branches bordered with dark *confusus*.

OPHIDOPELMA ORNATIPENNE Enderlein.

Hassenzan, June 22 to 27; Taihoku, April 28 (*Gressitt and Takahashi*).

MESOCÆCILUS QUADRIMACULATUS Okamoto.

Suisha, June 2 and 11; Taiheizan, May 21 (*Gressitt and Takahashi*). One of the most beautiful species of Psocidæ.

HEMICÆCILUS LIMBATUS Enderlein.

Hassenzan, June 22 to 27; Taihoku, January 18 (*Gressitt and Takahashi*). In one specimen the hind wing shows a faint infuscation near the tip and between the forks. Enderlein puts this species in his genus *Mepleres*.

HEMICÆCILUS TRANSVERSUS sp. nov.

Head dull yellowish, no definite marks, labrum dark, face with fine white hairs, vertex with long erect bristles; antennæ with scattered long hairs; thorax more brown than head, abdomen also; legs pale. Forewings much marked with brown; a broad crossband covering stigma and areola postica, a large elongate mark over outer half of anal vein, continued basally, a mark in the cell before it, two large spots in area before radial sector, one beyond the sector and before the transverse band, this narrowly connected to spots behind it in the next two cells, apical margin narrowly dark; many of the veins in the pale areas narrowly bordered with brown; hind wings unmarked, veins brown. Stigma elongate and low, wholly rounded behind; areola postica moderately long, above reaching about halfway to the medius; apical forks short and subequal.

Length, 3 mm.

FORMOSA, Taihoku, December 18 (*Takahashi*). Type, M. C. Z. No. 21761; paratype in Takahashi collection.

Differs from *H. nigroguttatus* Karny in broader forewing, areola postica higher, radial sector and medius united for much greater distance diverging more at separation.

HAGENIELLA FORMOSANA sp. nov.

Head pale, a transverse brown mark on middle of vertex, often a dark mark each side by eyes, and one in front near the ocelli; head with scattered, long, erect hairs; antennæ pale, basal joint with a dark mark, clothed with quite long, sparse hairs; thoracic notum dark brown, a pale mark each side from base of wing forward, and faint lines between the lobes, upper pleura dark; abdomen pale, legs whitish. Forewings hyaline, costal veins pale, others mostly brown, especially beyond middle of wings; base of radial sector and medius before it joining radial sector plainly margined with brown; stigma white, brown at base and more broadly so near tip; extreme tip pale, a faint brown band

across areola postica, one before end of cubitus, and another basad of ends of anals; hind wings hyaline, veins mostly pale, but base of radial sector and cubitus dark.

In some specimens the radial sector and medius join for a short distance, in others just touch, and in one are connected by a minute crossvein.

Length, 2.5 to 3 mm.

FORMOSA, Taihoku, March, June 7, December 6 and 16; Rokki, May 13 to 26; Urai, May 2; Arisan, May 24; Kuraru, June 5 (*Takahashi and Gressitt*). Type, M. C. Z. No. 21770.

EIPSOCUS HAGENI sp. nov.

Head whitish, three pale brown spots over ocelli, sometimes a faint brown mark at edge of vertex, back of eye; antennæ pale, basal joint with black dot outside, and the second joint with a black line; thorax pale; abdomen also very pale, with scattered black patches on each side, most numerous near base; legs very pale, tips of tibiæ and tarsi black; legs very long and slender.

Wings hyaline, veins also, but extreme tips of outer veins with a small but distinct brown mark; stigma whitish, no trace of any other marks; hind wing also hyaline and with pale veins, except two at tip are brown.

Venation similar to *E. delicatus* Hagen, and to *E. marginatus* Endl.; but areola postica more elongate and lower than in *marginatus*, stigma also slenderer than in *marginatus*. From *E. delicatus* the venation differs chiefly in that the space between radial sector and medius is much broader close to base, in *delicatus* it widens beyond base.

Length, 5 mm.

Rarasan, July 23; Hori, June 8; Rimogan, July 24; Rokki, May 13 to 26 (*Gressitt*); Shinten, April 3 (*Takahashi*). Type, M. C. Z. No. 21766; paratype in Takahashi's collection.

In *E. delicatus* Hagen (*completus* Banks) the forewings have a brown band near the outer margin and spots at the ends of the stigma as in *E. marginatus*; there is also a faint or distinct brown band running obliquely back from the basal end of the stigma, often meeting the end of the outer band, and towards the basal third of wing a transverse band. The areola postica in *delicatus* is slender as in *hageni*, much more so than in *marginatus*.

Epipsocus nubilipennis Karny, from Borneo, is practically the same as *delicatus*, but with the marks more extended. In a series from Mount Apo there are some strongly marked, others

only faintly so, but none as broadly marked as *nubilipennis*. *Epipsocus fuscofaciatus* Endl. is *Hageniella zonata* Hagen; Hagen's specimens vary in the connection between radial sector and medius.

ECTOPSOCUS CRYPTOMERLÆ Enderlein.

Taihoku, January 15, May 2, October 5; Hori, July 5 to 9 (*Gressitt and Takahashi*).

PERIPSOCUS QUERCICOLA Enderlein.

Kuraru, April 7, June 3 to 9; Urai, April 1; Sakahen, July 15; Taihoku, April 25 (*Gressitt and Takahashi*).

PERIPSOCUS SINGULARIS sp. nov.

Head red-brown, labrum black, rather densely clothed with short hairs, on basal part hardly longer than width of joint. Thorax black, clothed with appressed, short white hair, a pale stripe from base of wing obliquely forward, pleura mostly dark; abdomen brown, paler beneath; legs pale, tibiæ rather more brownish. Forewings uniform, pale, dull, dirty yellowish brown, veins mostly darker, especially cubitus which is heavier than usual, stigma about like veins; anal margin with many very short hairs; hind wings somewhat paler, veins mostly brown, cubitus also very distinct here.

Forewings with stigma quite long, not prominent behind, only gently rounded, and appearing much as in some species of *Cæcilius*.

Length, 4 mm.

FORMOSA, Taiheizan, May 21 (*Gressitt*). Type, M. C. Z. No. 21765.

This species has a stigma much like that of *P. sidneyensis*, of Australia; it is larger, with slenderer wings, and of a more yellowish tinge.

PARAMPHIENTOMUM NIGRICEPS sp. nov.

Nasus and front black up to above middle of eyes, across vertex a broad yellowish white band, faintly divided in the middle; cheeks pale; labrum and palpi pale, no distinct spines on palpi; ocelli in a low triangle, anterior one small, posterior nearly twice as far from eyes as from each other; dark parts with very minute white hairs; antennæ pale on base, brown beyond, moderately hairy, hairs about three to four times the width of joint; thorax brown, with white hairs, abdomen brown. Femora large, mostly dark, tibiæ with a dark band near base and another just beyond middle, basitarsus dark at base, tibia with many

spines, not as stout as in *Stimulopalpis*, teeth on claws very small, scarcely distinct. Forewings rich brown, mottled with white patches, mostly near costal border, and across wing near apical third, a more distinct spot in each apical cell; ends of veins on outer margin black, outer fringe partly brown, partly white; hind wings unmarked, veins brown. Forewing with radius showing just beyond crossvein a distinct bend. Hind wing with subcosta showing from its end a faint connection to radius.

Length, 3 mm.

FORMOSA, Taihoku, May 2 (*Gressitt*). Type, M. C. Z. No. 21763.

LEPIUM ENDERLEINI sp. nov.

Head yellowish brown, with moderately long white hair, vertex margin rather sharp; palpi brown; antennæ pale, moderately hairy; ocelli subequal, in a very broad low triangle, posteriors fully four times as far apart as from eyes. Forewings covered nearly uniformly with black and metallic scales; fringes long, costal one dense and towards tip fully one-fifth wing width, and those on outer part of hind margin nearly one-third wing width. Hind wings hyaline, veins nearly black, fringes black, very long on outer half of costa and outer margin; membrane in apical half of wing hairy.

Venation similar to that in *L. chrysochlora*; pedicel of cubital forks longer, radius and radial sector more widely separate at tips; hind wing slenderer and more pointed.

Length, 3.4 mm.

FORMOSA, Hori, June 6; Hassenzan, June 19 (*Gressitt*); Taihoku, June 4 (*Takahashi*). Type, M. C. Z. No. 21764; paratype in Takahashi collection.

PSOQUILLA MARGINEPUNCTATA Hagen.

Taihoku, September 8 (*Takahashi*), many specimens. Nearly all are of the typical short-winged form of both sexes; among them are four that have much longer forewings and well-developed hind wings. One of these is figured (Plate 2, fig. 14). The marginal spots are retained, but the dark is broken up by two irregular hyaline bands. Several of the veins towards the tip become somewhat irregular and sometimes have short lateral spurs. In the hind wing is a dark spot at the end of the cubitus. The head and other parts are as in the short-winged form, so I think there can be no doubt that they are long-winged forms of the same species.

PERLIDÆ

CERCONYCHIA BRUNNEA Klapalek.

Pianan, May 11; Hassenzan, June 22; and Taiheizan, May 8.

CERCONYCHIA LIVIDA Klapalek.

Urai, May 1 and 2; and Musha, May 18. The *Nogiperla* of Okamoto might be this genus; but his figure shows no radial crossveins; the species would be distinct from either of Klapalek's species.

PELTOPERLA FORMOSANA Klapalek.

Taiheizan, May 9.

KAMINURIA FORMOSANA Okamoto.

Urai, May 3 and 8.

TOGOPERLA ÆQUALIS sp. nov.

Male.—Above black; abdomen reddish yellow, venter and sternum yellowish; legs pale, tips of femora, upper edge of tibiæ and the tarsi dark; antennæ and palpi brown, former paler on basal part; wings brown, costal area pale yellowish as well as the veins here, other veins dark brown; a large pale spot each side of ocelli.

Female.—More yellowish on head, the large ocellar mark broadened in front, but hardly connected to the anterior spot, the M-mark pale; pronotum more or less pale brown in middle, black on sides, the deflexed sides black only on edge; wings more yellow-brown than in the male, but much darker than the yellow costal area; apical segment of abdomen pale.

Ocelli almost as near to eyes as to each other; eyes round, superior boss transverse, nearer to eye than to ocellus; pronotum a little broader than long, a trifle narrowed behind, anterior angles acute, hind angles almost square, median area not well marked, sides moderately rugose.

Forewings with about ten to thirteen costals, three or four subcostals, about seven median, and nine to eleven cubital crossveins; radial sector with two or three branches, the first sometimes from the crossvein; crossvein from radius to radial sector oblique; in hind wing about eight cubital crossveins; radial sector with two or three branches. Female with pronotum proportionally broader.

Male with sixth and seventh ventral segments each having a median patch of short, stiff brown hair; fifth dorsal segment a little swollen behind, roughened or spinulose near edge, and with a slight process each side bent downward; appendages

very elongate; with a small lobe at base of each. Abdomen of female ending in a median pointed part and a narrow hook each side; ventral plate swollen out narrowly over next segment and slightly emarginate at tip.

Male, length, 10 to 11 mm; forewing, 13 to 16; female, body, 14 to 15; forewing, 18 to 19.

FORMOSA, Shikayan and Pianan, May 11 and 12. Type, M. C. Z. 20196.

TYLOPYGE SIGNATA sp. nov.

Male.—Yellowish, thorax and abdomen more tawny; head with a large median black mark from ocelli to the M-line, a narrower black mark on clypeus; antennæ pale on basal part, dark beyond; palpi dark; pronotum with a broad black median stripe, broader behind, front, sides, and hind margin rather broadly black, thus leaving a large pale spot on each side of pronotum, deflexed sides black; notum somewhat darkened around scutelli; femora mostly yellow above, tip, and tibiæ and tarsi black; a median dark patch of hairs on fifth ventral segment, and between hind coxæ, but neither as large nor with so long hairs as in *T. planidorsa*; setæ pale on base, darker beyond. Wings brown, except yellow costal margins to both pairs; costal veins yellow, others dark brown; in some places the middle of the cells paler brown.

General structure like that of *T. planidorsa*; hind ocelli much smaller than in that species, scarcely larger than anterior ocellus, nearly as far apart as from eyes; superior boss larger than ocellus, oblique, and much nearer to eyes than to ocellus.

Pronotum broader than long, narrowed behind, front angles acute, hind corners rounded; median area moderately broad, rugose on sides, mostly towards middle. Forewings with about ten costals, two or three subcostals, six or seven median, and seven or eight cubital crossveins; radial sector with one branch, and one from the crossvein, lower branch of median forked beyond the crossvein; hind wings with about six cubital crossveins, radial sector with two branches.

Male with both sixth and eighth dorsal segments having a median patch of spinules on apical part of segment.

Length, 11.5 mm; forewing, 15.

FORMOSA, Urai, April 2. Type, M. C. Z. 20193.

Differs from *T. minor* in having costal area yellow, dark palpi, and spinules on the sixth as well as the eighth segment. The appendages are much slenderer than in *T. minor*.

TYLOPYGE PLANIDORSA Klapalek.

Rokki, May 12; and Hassenzan, June 25.

Genus SCHISTOPERLA novum

Two ocelli, far apart; head prolonged back of eyes more than length of eye, eyes rather small; no median furrow on back of head; lateral sutures nearly parallel and reaching back to superior boss, not touching eyes; pronotal side margins not deflexed so that pronotum is angulate on sides. Body rather long; wings moderately long, venation similar to that of *Neoperla*. Male genitalia simple, a hairy boss on ninth ventral, and appendages short, close together, and divergent. Ventral plate of female large.

According to Klapalek this would be an acroneurine because of the male genitalia, according to others a neoperline. The nearly parallel sutures on the metasternum reaching almost to the hind margin and the head structure distinguish it from both groups. Probably related to the American *Kathroperla* and *Paraperla*, all lacking the deflexed sides to pronotum, and with the head extended behind eyes; the American genera, however, differ in metasternal sutures, ocelli, sutures on head, and other details.

SCHISTOPERLA COLLARIS sp. nov.

Black; head dull black, a little reddish each side in front; pronotum black, sides broadly margined with yellow; notum dull black; abdomen brown, setæ scarcely paler; antennæ and palpi brownish; legs dark brown to black; wings dark brown, costal area with the veins here pale yellow, other veins dark brown.

Head broad in front, M-line with the middle part distinct, back of this a transverse impression; from anterior part of eye a line to the superior boss; ocelli at least six diameters apart; superior boss close by side of ocellus, and more than twice as large; surface of head with fine short hair. Pronotum broader than long, sides angulate in middle, median area rather wide, surface each side moderately rugose; abdomen elongate, slender, clothed with fine short hair, setæ short, bristly besides the fine hair.

Male appendages appear as two erect approximate pieces, above diverging and tips rounded; last dorsal segment reddish, with a forked, median black mark, and a black stripe each side, an elevated spot at end of each stripe. Ventral plate of female greatly extended, almost to tip of abdomen, with a distinct median notch.

Forewings with about ten costals, four subcostals, about ten median and nine cubital crossveins; radial sector with two branches beyond and one from crossvein; crossvein from radius to radial sector at right angles; the two branches of anal cell far apart at base; in hind wings six to eight cubital crossveins, radial sector with three branches or with two branches and one from the crossvein.

Length, 14 to 15 mm; forewing, 17 to 18.

FORMOSA, Taiheizan, May 6 and 7. Type, M. C. Z. No. 20190.

MESOPERLA CRUCIGERA Klapalek.

One female, 54 mm, from Rokki, May 15, is probably this species, which was described from a male; the markings on the thorax are not as distinct as described; the ventral plate is truncate, about three times as broad as long. The genus must be near *Acroneuria* as the metasternum shows the same Y-shaped suture.

KIOTINA LUCIDA Klapalek.

Hassenzan, June 24.

FORMOSITA HATAKEYAMÆ Okamoto.

Urai, April 30.

Key to the species of Neoperla.

1. Pronotum and head with distinct median black marks; venation scarcely paler on costal area..... 2.
 Pronotum and head scarcely, if at all, marked with black; venation distinctly paler on costal area 3.
2. Forewing scarcely 10 mm long..... *signatalis*.
 Forewing fully 18 mm long..... *klapaleki*.
3. Length of forewing about 10 to 12 mm..... *formosana*.
 Length of forewing about 16 to 18 mm..... *uniformis*.

NEOPERLA UNIFORMIS sp. nov.

Female.—Yellowish, not very clear, scarcely marked with dull brown. Ocelli on black spots, a brownish cloud over lower part of face; antennæ and palpi also yellowish; pronotum dull yellowish brown, rather darker on sides; abdomen pale throughout, also setæ; legs a little darker on upper edges and tips of tarsi; wings dull gray, costal area and veins there pale yellow, other venation rather dark brown.

Ocelli about two and one-half diameters apart, much farther from eyes; superior boss rounded, nearer to ocellus than to eye; pronotum broader than long, front corners acute, hind corners broadly rounded, middle area rather narrow, sides strongly rugose.

Forewing with about ten to twelve costals, three or four subcostals, about eight median and five cubital crossveins; three branches from radial sector beyond crossvein and usually one from crossvein. In hind wing about five cubital crossveins, two or three branches to radial sector.

Female with ventral plate not projecting, but indicated on margin by a slight median swelling.

Length, 13 mm; forewing, 17 to 18.

FORMOSA, Hassenzan, June 22; Urai, May 3; Funkito, June 8. Type, M. C. Z. No. 20195.

NEOPERLA SIGNATALIS sp. nov.

Female.—Pale yellowish; a prominent square black mark over ocelli and forward to clypeus, a triangular black spot on clypeus; antennæ and palpi yellowish brown; pronotum with a broad, median black stripe and the front and side borders narrowly black, deflexed sides black; notum rather brownish yellow; abdomen similar near tip above; wings gray, veins yellow gray, costals a little paler; legs pale, upper edges darker.

Ocelli small, about three diameters apart, only a little farther from eyes; pronotum broader than long, front corners acute, hind corners broadly rounded. Forewing with seven or eight costals, two or three subcostals, about six in both median and cubital series; radial sector with two branches; radial cell much shorter than radius to base. Hind wing with about six cubital crossveins, radial sector with two branches. Male with last ventral ending in a rather sharp point, the superior appendages reach forward to a very short extension of seventh segment.

Length, 8 mm; forewing, 10.

FORMOSA, Urai, June 1. Type, M. C. Z. No. 20192.

NEOPERLA KLAPALEKI sp. nov.

Female.—Pale yellowish; a large black spot in ocellar area, and a narrow black one on clypeus; pronotum with a broad black stripe through middle, the front and sides narrowly black; mesonotal humps dark; tip of abdomen scarcely darkened; legs pale, upper edges of femora and tibiæ, and the extreme tips of tarsi dark brown. Wings hyaline, not darkened, venation pale, costal veins only a little paler than others.

Ocelli of moderate size, about two diameters apart, about twice as far from the eyes; superior boss rather large, transverse, about as near to ocellus as to eye. Pronotum much broader than long, slightly narrowed behind, front corners acute, hind corners rounded, middle area plainly marked, side carina curved

at each end, surface of sides plainly roughened; tip of abdomen shows the last segment projecting in an even curve; ventral plate scarcely convex in middle.

Forewing with about eleven costals, four subcostals, six median and seven cubital crossveins; two branches from radial sector; crossvein from radius to sector not oblique, and interstitial with that from radial sector to medius, and of about the same length; radial cell almost as long as radius to base of wing; hind wing with eight cubital crossveins, two branches to radial sector.

Length, 15 mm; forewing, 19.

FORMOSA, Pianan, May 11. Type, M. C. Z. No. 20194.

NEOPERLA FORMOSANA Okamoto.

Rokki, May 16; Hassenzan, June 22 and 23; Suisha, June 1; Hori, June 6; Funkito, June 8. Common.

AMPHINEMURA FLAVICOLLIS Klapalek.

Hassenzan, June 22 and 27; Hori, June 9; Urai, April 1; Bukai, June 13; Sozan, March 29; Musha, May 18.

AMPHINEMURA NIGRITULA Navas.

Arisan, June 3 and 4; Taiheizan, May 9.

PROTONEMURA BREVILOBATA Klapalek.

Rokki, June 16; Sozan, March 29; Urai, April 1; Hori, June 9; Taihoku, March 27.

NEMOURA PLUTONIS sp. nov.

Female.—Jet black, polished, wings faintly paler in middle of some cells, clypeus triangular; ridge across at antennæ prominent; ocelli small, a little nearer to eyes than to each other; eyes large and prominent. Pronotum about as long as broad. Wings elongate, about six median and eight cubital crossveins; radial sector rounded at base, without stump of a vein; median arises longer than first median crossvein before radial sector, its base before first median crossvein nearly straight, not plainly curved; first anal vein bent in a long curve beyond anal cell; second anal vein forked more than length of end of anal cell beyond anal cell; subcostal crossvein beyond radial subcostal crossvein about twice the length of the latter vein.

Length, 10 mm; forewing, 11 to 12.

FORMOSA, Sozan, March 30, and Hassenzan, June 22. Type, M. C. Z. No. 20191.

RHOPALOSOLE DENTATA Klapalek.

Arisan, May 23, June 3; Moji, April 17; Hassenzan, June 22; Hori, June 8; Urai, April 1; Kusukasu, April 12; Musha, May 18; Taiheizan, May 6.

SIALIDÆ**PROTOHERMES COSTALIS** Walker.

Rokki, May 13; Hori, June 19.

NEOCHAULIODES FORMOSANA Okamoto.

Antsu, April 28; Mount Kannon, April 28.

SIALIS KUMEJIMÆ Okamoto.

Several females, all from Taiheizan, May 8, are probably of this species, which was described from Okinawa Island.

RAPHIDIDÆ**RAPHIDIA FORMOSANA** Okamoto.

Hassenzan, June 24; Arisan, June 4.

DILARIDÆ**DILAR (NEPAL) FORMOSANUS** Okamoto and Kuwayama.

Similar in size and appearance to *Nepal hornei*; marks on forewings about the same; legs more distinctly marked with dark at tips of joints than in *N. hornei*, and the processes on antennæ rather darker than in that species; thorax dark on sides, pronotum with the usual row of four pale spots. On head the anterior wart plainly smaller than posterior warts (in *hornei* about equal in size); joints of antennæ becoming elongate sooner and the processes very plainly shorter than in *hornei*; for example, the fourth process in *hornei* more than reaches the base of antenna, while in this it is far short of that distance; male claspers larger and more elongate than in *hornei*. Forewing with thirteen subcostal crossveins, seven to nine radials, four branches to the second radial sector, four crossveins between first and second radial sectors, four between first radial sector and medius, the outmost of these crossveins a somewhat gradate row, but slanting obliquely outward behind, only two crossveins between median forks, five crossveins between lower medius and cubitus, and four crossveins between branches of cubitus. Hind wing with venation similar to that of *hornei*, but with only three or four crossveins between radius and radial sector (six or seven in *hornei*). Pupillæ hardly distinct.

Length of forewing, 8 mm; width, 3.

FORMOSA, Musha, May 20 (*Gressitt*).

Described from a female. The type was said to have but one radial sector; I have two males which have two, as all allied forms, and the wings are more banded than indicated in original description; however, it is not likely that there are two species in this section on Formosa.

DILAR TAIWANENSIS sp. nov.

Dull yellowish, with yellowish to tawny hair; some brownish on clypeus; second joint of antennæ brown below, processes dark brown; mesonotum with a dark brown spot in the middle; abdomen brown; legs with a distinct brown mark at knees, tip of tibia, and less distinctly at tips of the tarsal joints. Forewings faintly marmorate with pale brown, quite distinctly in apical part of costal area, fairly plain behind the cubitus, in the apical area rather faintly, in the midbasal area scarcely noticeable; pupillæ very distinct and surrounded by a brown cloud. Where the brown marks are at all plain they are arranged in narrow transverse bands, about a dozen in the area behind cubitus; where these marks touch veins the veins are brown, elsewhere pale; hind wings dull yellowish; no marks, except the one pupilla.

Forewings with eleven subcostal crossveins, not evenly spaced, about twelve radials, also unevenly spaced, on one wing five branches of radial sector, on the other, three branches; between medius and cubitus about seven to nine crossveins; between branches of cubitus five crossveins; between forks of first radial sector four crossveins; all crossveins irregularly placed, no semblance of rows.

Hind wing with first radial sector not united to second near base, but quite separate and with an extension back to base of medius; second radial sector with about five branches; basal cubital cell very elongate, more so than usual, two crossveins between medius and cubitus, one near base, the other towards tip; two median crossveins; two between first radial sector and medius, one near base, other far out towards tip; four crossveins between the two radial sectors, pupilla between second and third, eight radial crossveins, unevenly spaced; about twenty-eight costals; crossveins show little tendency to be in rows (so different from *nietneri*, *marmoratus*, *harmandi*). Vertex rather narrowly elevated, smooth middle area quite narrow, especially in front, hairy wart each side no wider than smooth space, an-

terior wart much smaller than others; antennæ with joints bearing long processes about as in *D. corsicus*. Pronotum in front with two subtriangular scalelike lobes.

Forewing, length, 13 mm; width, 5; hind wing, length, 11.5; width, 5.

FORMOSA, Arizan, June 4 (*Gressitt*). Type, M. C. Z. No. 20229.

CONIOPTERYGIDÆ

CONIOPTERYX ALBATA Enderlein.

Specimens from Taiheizan, Sozan, Sakahen, Musha, and Hassenzan, May and June, agree with this Japanese species.

MALACOMYZA PULVERULENTA Enderlein.

From Kuraru, Bukai, Pianan, Musha, and Hassenzan, in May and June.

In most cases the crossvein from subcosta to radius is interstitial with the radial crossvein, and sometimes the medio-cubital crossvein is not its length before the fork of medius; the elevated rounded black spots on the mesonotum are very prominent.

CONIOCOMPSEA FURCATA sp. nov.

Face brown, hairy; palpi black, short and thick, vertex elevated, smooth, yellowish; antennæ dull yellowish, thick, joints narrowed at base, clothed with pale yellowish hair. Notum dark brown, anterior lobes elevated, transverse polished; legs dull yellowish, femora much darker. Forewings with many large, often connected, pale brown marks; large ones over most of the basal part of space between subcosta and radius, and between radius and radial sector, spots over the three principal crossveins, and spots around or near the ends of various veins (some variation in the size and connections of these spots); hind wings unmarked.

Forewing with median vein plainly forked towards tip, basal part of medius very tenuous and indistinct, but the two enlarged spots for bristles plain; base of radial sector broken, apical part suddenly narrowed, radial and radial-subcostal crossveins interstitial, base of cubital fork very faint.

Hind wings with venation similar to that of *C. vesiculigera*, the median vein unforked, basal part indistinct but just before the crossvein a swelling for a bristle; branches of cubitus connected by a crossvein near margin.

Length, 3.5 mm.

FORMOSA, Hassenzan, June 27 (*Gressitt*). Type, M. C. Z. No. 20212.

OSMYLIDÆ

SPILOSMYLUS JAPONICUS Okamoto.

Suisha, June 1; Rokki, May 13 and 16; Kuraru, May 5; Chirifu, May 19.

This Formosan species has been identified by Esben-Petersen as *S. tuberculatus* of the Malay Peninsula, and, following him, by Nakahara. At about the same time Okamoto described *S. japonicus*, which is close to *tuberculatus*, and has, like that species, twelve radial and twelve cubital crossveins. The markings are also similar. *Spilosmylus modestus* from the Sunda Islands and the Philippines is also near, in fact *modestus* may be the same as *tuberculatus*, there being only minor differences in markings. The differences are: In *japonicus* (both Japanese and Formosan specimens) the first crossvein from median to radial sector ends on the sector before the origin of the first branch; in *tuberculatus* (and *modestus*) this crossvein ends out on the first branch of radial sector. In *japonicus* the bulla is plainly longer than high, while in *tuberculatus* (and *modestus*) the bulla is nearly circular.

HEMEROBIIDÆ

NOTIOBIELLA SUBOLIVACEA Nakahara.

FORMOSA, Hassenzan, June 22; Taihoku, May 2. LOOCHOO ISLANDS, Iriomote Island, August 20 and 21.

ANNANDALIA CURTA Needham.

Two from Hori, June 8, and Rokki, June 13; one from the Sauter lot sent by Esben Petersen as *maindronina* Navas. *Curta* is an older name. Quite possibly both are *iniquus* Hagen; but the three Hagen types differ from all the *curta* I have seen (including two from Peradeniya, Ceylon) in that the second of the gradate veinlets is more than its length before the first, and the third is more than its length beyond the fourth; in *curta* these veinlets form a much more even row.

NINGUITA DELTOIDES Navas.

Two from Arisan, June 2. These are not as evenly marked as the Japanese form; the wing is mostly pale, with many pale brown marks, and some darker marks along the subcosta, the middle and outer gradates are in a dark line (although three of the outer gradates are hyaline white); the inner gradates are not noticeably marked, and from the inner end of the series

there is a silvery white line curving back towards the hind margin of the wing, and then back to the base of the wing.

MEGALOMUS FORMOSANUS sp. nov.

Face pale; a dark band across below antennæ; antennæ and palpi pale, unmarked; vertex dark, as also pronotum and mesonotum; a pale spot on vertex by side of eye, one on anterior side of pronotum, and one on side of anterior lobes of mesonotum, the three spots in a row. Metanotum pale with a large brown spot each side and a long black one in the middle; pleura with some dark spots. Legs pale, front tibiæ dark near base and near tip; abdomen pale brown, lateral sutures black.

Wings with more or less distinct bands of brown, mostly oblique; one before first gradate series is the broadest; a dark brown spot just beyond stigma between radius and radial sector, a larger spot over several of the upper gradates of outer series, another near basal angle of wing, one before stigma; about eight smaller spots along radius, and three along cubitus, other smaller spots or dots on some veins; upper gradates of both series brown, and small brown spots along borders of wing. Hind wing with a cloud over upper outer gradates, and faint clouds at outer angle and middle of hind border.

Forewings broad as usual; venation very similar to the European *M. hirtus*; in hind wing the inner gradates nearer to base; in forewing seven, in hind wing six, branches of radial sector.

Expanse, 19 mm.

FORMOSA, Arisan, June 4. Type, M. C. Z. No. 20197.

Bestreta japonica Navas, said to be related to *Megalomus*, is a larger insect, the basal joint of antenna paler than rest, and other differences.

HEMEROBIOUS SPINIGERUS sp. nov.

Head pale yellowish, a dark brown mark under each eye; antennæ pale yellowish, not darkened near tip; pronotum pale, broad, brown side margins; mesonotum also with broad, brown stripe each side, pale through middle; metanotum mostly dark, scutellum pale; abdomen pale brown; legs pale. Wings not much marked, veins with dark spots or dots, a larger mark on basal angle, and crossvein across cubitus dark brown; gradates dark.

Wings moderately narrow, costal area as narrow as in *H. humuli*, three radial sectors, last forked three times; six inner gradates, next to last much before last, seven outer gradates;

in both series each gradate well separated; crossvein between median and radius close to base. Hind wing with radial sector forked three times; three inner gradates, five or six outer ones.

Expanse, 16 mm.

FORMOSA, Koripapono, April 17; Shonoryo, June 11; Arisan, May 26. Type, M. C. Z. No. 20198.

In general appearance this is similar to *H. japonicus*, but the male genitalia are different.

MICROMUS NOVITUS Navas.

Two from Arisan, June 6; and Hassenzan, June 23.

MICROMUS SAUTERI E. Petersen.

Many specimens from Formosa and Iriomote Island.

CHRYSOPIDÆ

NACAURA MATSUMURÆ Okamoto.

One from Rokki, May 17.

NOTHOCHRYSA JAPONICA McLachlan.

Riran, April 20.

NOTHOCHRYSA UCHIDÆ Kuwayama.

One specimen of this fine species from Hori, June 16.

ANKYLOPTERYX OCTOPUNCTATA Fabricius.

FORMOSA, Hori, June 6. LOOCHOO ISLANDS, Iriomote Island, August 20.

ANKYLOPTERYX DOLESCHALI Brauer.

One from Iriomote Island, Loochoo Islands, August 20.

ANKYLOPTERYX DELICATULA sp. nov.

Body mostly green, venter, pleura, and face whitish. A dark brown spot each side under eye, and one each side on clypeus; each side on face close to eye and below antennæ is a dark dot; basal joint of antenna with a dark line on outer side, rest wholly pale; a black dot between bases of antennæ; pronotum pale in middle, green on sides, a dark spot on each side in front; mesonotum with a dark stripe on sides extending back along margins of mesoscutellum, a dark mark on sides of metascutellum; legs with a dark dot on front and middle tibiæ, and tips of tarsi dark.

Wings with green venation; basal subcostal crossvein and extreme base of some radial crossveins black, also near base the veins in two black spots black; the first of these spots is out

from the anal angle along the ends of four veins, second larger and over the ends of first anal vein up to third cubital cell and over base of that cell; along hind margin a few faint clouds at ends of three or four veins, and a similar faint cloud over the lowest of inner gradates, and still fainter clouds over some of the others; stigma with a short dark mark at base; outer end of some of costals also dark. Hind wing with a long dark margin from anals out to near middle of hind margin, often extending up a bit on the veins. In general structure, width of costal area, shape of divisory cell, curvature of radial sector, and other characters it is very similar to *octopunctata*; eleven radial crossveins, six cubital crossveins beyond divisory, five inner gradates, six to seven outer.

Forewing, length, 11 mm; width, 4.5. Type, M. C. Z. No. 20224.

LOOCHOO ISLANDS, Okinawa Island, August 31 (*Gressitt*).

Differs from all other species by the dark marks at base of wings, and from *octopunctata* by lack of dark in the stigma of hind wing.

Key to the species of Chrysopa.

1. Antennæ black towards base; head and antennæ at base reddish; gradates black; large species; hairs on veins very short..... *ruficeps*.
Antennæ pale 2.
2. Venation wholly pale 3.
Venation partly black, at least some of the gradates..... 4.
3. A dark spot each side on the face..... *anpingensis*.
No such spot *peterseni*.
4. Mesonotum black across front, the black extending out on the costal margin for a short distance; three spots in a row on face; costal area very broad towards base..... *decorata*.
Characters not as above..... 5.
5. Both first and second joints of antennæ with dark mark on outer sides, several spots on face; crossveins mostly black..... *cognatella*.
At most a spot or stripe on basal joint, face with few marks, not so many crossveins black 6.
6. Face with a large X-mark between the antennæ, eight cubital crossveins beyond the divisory *furcifera*.
Face without an X-mark 7.
7. Basal joint with a red or black mark on the outside; six cubital crossveins beyond the divisory 8.
Basal joint without any marks, eight cubital crossveins beyond the divisory cell 9.
8. Cheeks with black spot; hardly any costal cells twice as broad as long *astur*.
Cheeks unmarked; pronotum with dark dot each side; many costal cells fully twice as broad as long..... *eudora*.

9. Palpi pale; pronotum not dark on sides..... 10.
 Palpi mostly black; pronotum dark on sides; radial sector but little
 curved *marcida*.
 10. Four black spots on the face..... *cognata*.
 No black spots on the face..... *adonis*.

CHRYSOPA COGNATELLA Okamoto.

LOOCHOO ISLANDS, Okinawa Island, July 6. Agrees well with description, except that there is no reddish margin to pronotum. Known previously from Japan proper.

CHRYSOPA DECORATA E. Petersen.

FORMOSA, Hassenzan, June 24; Shinten, April 3. LOOCHOO ISLANDS, Okinawa Island, August 31.

CHRYSOPA BASALIS Walker.

Several from Riran, April 19 and 20. This is *C. formosana* of E. Petersen and *C. peterseni* Okamoto. There is an earlier *C. peterseni* by Navas from Greece (1911).

CHRYSOPA ANPINGENSIS E. Petersen.

Taihoku, June 29. I believe that *C. boninensis* of Okamoto is the same form.

CHRYSOPA FORMOSANA Matsumura.

FORMOSA, Hassenzan, June 22; Kuraru, August 12. LOOCHOO ISLANDS, Iriomote Island, August 23 and 24. This is *C. sauteri* E. Petersen.

CHRYSOPA ADONIS sp. nov.

Pale yellowish or greenish; face, antennæ, and palpi unmarked, as also the pronotum. Wings with green longitudinal veins and many of the crossveins dark or black; gradates, costals on basal half, end forks of anal, and crossvein above to cubitus wholly black; radials and cubitals dark in the middle, some of the branches of cubitus to margin dark; outer forks unmarked. Stigma fairly distinct, although crossveins continue through it. Hind wings with gradates and some of costals partly or wholly dark, some radials dark in middle. Forewings not acute, with rather long hairs on veins, some on costals as long as cells; many costal cells two to three times as broad as long; twenty-five costals to stigma, fifteen to sixteen radials, eight cubitals beyond the divisory, six branches of radial sector before gradates, the first ending much before end of the divisory veinlet; nine gradates in each row, mostly not their length apart, the two rows slightly divergent above, outer row no nearer to margin than to inner row; divisory cell rather small, its base only

slightly oblique; postcubital area more than twice, almost thrice, as wide as cubital area. Hind wings with eight gradates in each row, subparallel, and the outer nearer to inner row than to margin; where radial sector meets medius a fairly large triangle.

Forewing, length, 17 mm; width, 6.

FORMOSA, Hassenzan, June 26 (*Gressitt*). Type, M. C. Z. No. 20228.

CHRYSOPA ASTUR sp. nov.

Greenish yellow, a pale yellow stripe through middle of dorsum; a large black spot on each cheek; palpi pale, somewhat marked with black; basal joint of antennæ with a black mark on outer side; thorax and legs unmarked. Forewings with largely greenish venation, but gradates black, costals partly dark at outer ends, the usual crossveins near base dark, and indistinctly dark on a few other veins; in hind wings only the gradates and costals dark.

Basal joint of antennæ short, broad, globose; pronotum a little longer than broad, narrowed in front, finely short-haired.

Forewings hardly acute; hairs on veins of moderate length; eighteen costals before stigma, ten to eleven radials, six cubitals beyond the divisory, four branches of radial sector before gradates, first ending much before end of divisory cell; four inner gradates, seven outer, each well separated from next of row, the two rows subparallel, hardly as near each other as outer to margin; radial sector only slightly sinuous, hardly any costal cells twice as broad as long, postcubital area one and a half times as broad as the cubital area.

Hind wing with three inner gradates, six outer, rows widely separate, the outer much nearer to outer margin than to inner row; a small elongate triangle where radial sector meets medius.

Forewing, length, 11 mm; width, 3.5.

LOOCHOO ISLANDS, Iriomote Island, August 24 (*Gressitt*). Type, M. C. Z. No. 20225.

CHRYSOPA EUDORA sp. nov.

Yellowish; palpi pale, last joint partly dark; basal joint of antenna with a red line on outer side, vertex with a red mark each side close to the eye; pronotum with a dark dot near middle of each side; mesonotum with a faint reddish spot on each anterior lobe. Forewings with mostly greenish venation; gradates very plainly black, several crossveins towards base of wing wholly black; costals, radials, and cubitals often dark at one or

both ends, marginal forks and branches of cubitus unmarked; stigma hardly noticeable; hind wings with some gradates partly dark, otherwise venation pale. Forewings acute at tip; hairs on veins of moderate length; twenty-five costals, twelve radials, six cubitals beyond divisory, five branches of radial sector before gradates, the first ends much before end of divisory cell; seven inner, eight to nine outer gradates, in subparallel rows, outer only a little nearer to margin than to inner row; third and fourth cubital cells each with two branches to margin, fifth with one (in most species it is the fourth that has but one, but it varies somewhat); many costal cells fully twice as broad as long; post-cubital area twice as broad as cubital area.

Hind wings with seven gradates in each row; where radial sector meets medius a much larger triangle than usual.

Pronotum much longer than broad, and much narrowed in front; basal joint of antenna not very globose, rather elongate.

Forewing, length, 15 mm; width, 5.

FORMOSA, Hassenzan, June 24 (*Gressitt*). Type, M. C. Z. No. 20226.

CHRYSOFA MARCIDA sp. nov.

Pale yellowish; a black mark each side on clypeus; palpi practically wholly black; antennæ unmarked, basal joint scarcely globose; pronotum with red-brown stripe on each side margin; notum unmarked, abdomen greenish. Forewings with veins largely pale, gradates dark, costals often partly dark, and usual crossveins near base dark; stigma not distinct, crossveins continuing right through in unbroken series.

Hind wings with gradates scarcely darkened, otherwise pale.

Forewings scarcely acute at tip; hairs on veins moderately long, some on costals equal the cells; about twenty-six costals to where the first subcostal starts, but nine more beyond to tip; fourteen radials, eight cubitals beyond the divisory, three or four branches of radial sector before gradates, the first ending much before end of divisory cell; nine or ten inner, eight outer, gradates, the inner row extending basad, outer row nearer to inner than to outer margin; postcubital area almost twice as broad as cubital area.

Hind wings with nine inner, eight outer gradates, the inner row with two gradates more basad. Pronotum scarcely as long as broad, much narrowed in front.

Forewing, length, 14 mm; width, 5.

FORMOSA, Arisan, May 25 (*Gressitt*). Type, M. C. Z. No. 20227.

Besides the above species, *Chrysocera formosana* Okam. is from Formosa, a form with long cerci at tip of abdomen of male. Navas has described two: *Mallada stigmatus*, 1924, which must be close to *C. peterseni*, but his figure of the stigma is broader than in that species; *Chrysopa feana*, 1929, which has a red line on the basal joint of antennæ, a red stripe on each side on the pronotum, the sides of meso- and metanotum dark. I have seen none so marked.

Chrysopa ruficeps McLach. is a large species with very short hairs on the veins, venation pale, but the gradates black. What Okamoto called *ruficeps* is said to have venation wholly pale; I doubt if the true *ruficeps* occurs on Formosa.

Chrysopa cognata is a well-known species of Japan proper, with four spots on the face.

Chrysopa furcifer is also a well-marked species of Japan.

Chrysopa remota Walk. is recorded by Okamoto. It was described from two specimens from the Navigators Islands (Samoa) and one from the Loochoo Islands. Petersen has described and figured the species from Samoa, and since the Loochoo Islands are over 4,000 miles from Samoa it is very improbable that the specimen from Loochoo Islands is of the same species as those from Samoa.

Chrysopa basalis Walk. was described from the Loochoo Islands; it is quite possible that it is the same as *C. peterseni*.

MYRMELEONIDÆ

NOUES ELEGANS sp. nov.

Head with a large black band above, below, and between antennæ from eye to eye; below, face pale, a narrow pale band above from eye to eye, rest of vertex black; palpi wholly pale, very short; antennæ almost black, some joints towards base very narrowly pale, basal and ring joints very pale. Pronotum pale, lateral margins behind sulcus, a narrow median line, a spot each side in front, and a streak in middle of each side of hind part black or almost so; hair quite long and mostly black. Anterior lobes of mesonotum black in front, pale above, large black spots inward of each wing, connected across base of scutelli, latter black through the middle; pleura pale, with a broad black streak, broader in front. Legs pale, femora dark near tips, especially above; front tibiæ dark in front, others with subbasal and apical dark marks; tarsi scarcely darkened. Abdomen with short, mostly black hair; venter pale, above dark, large pale mark on base of third segment and less distinctly

beyond, genital parts pale. Wings hyaline, venation black and white, longitudinal veins usually in streaks, crossveins usually wholly black or wholly white, most of the white ones in basal half, and in a large patch before and beyond rhegma; subcosta dark at base of each costal crossvein, about ten elongate and several smaller dark marks between subcosta and radius; several smaller clouds along cubitus, another at union of cubital fork and first anal vein, a still larger one over and up from rhegma; many marginal forks with small dark marks; stigma white, dark at base; in hind wings more veins dark; stigma white, a distinct cloud at rhegma, and traces of the spots between radius and subcosta. Antennæ long, rather widely separated at base; palpi very short; vertex somewhat elevated, truncated across middle, with a median impression. Legs slender, not very long, femora cylindrical; hind pair largely black-haired, others with some white hairs; front tarsus nearly as long as tibia, basitarsus equals next two joints together, but shorter than apical joint, spurs little more than two joints, only slightly curved; abdomen short.

Forewing with costals from middle out mostly forked, and connected by oblique crossveins, thus making two rows of cells; apical area with one row of gradates; four or five crossveins before radial sector, beyond about sixteen before stigma, two beyond stigma; eight or nine branches of radial sector, sector arising plainly before main cubital fork; basal cubital fork distinct; first anal bending up near tip and running into cubital fork; second anal in an even curve free of first anal, bending to touch third anal at one point; just beyond a crossvein back to first anal; third anal forked.

Hind wing with radial sector arising much before cubital fork, one crossvein before it; first anal bending down opposite cubital fork, and connected to the fork once, six branches to hind margin, second anal forked, upper branch connected once to first anal.

Body, length, 22 mm; forewing, length, 31; width, 9.

FORMOSA, Sakahan, July 13 (*Gressitt*). Type, M. C. Z. No. 20199.

This genus, described from Assam, belongs to the *Dendroleoninae*, and to the tribe *Dendroleonini*; the hind basitarsus being a little shorter than the apical joint would bring it near *Glenoleon* and *Platyleon*; it looks very similar to the latter genus, but the second and third anals of forewing touching will readily separate it.

GLENUROIDES OKINAWENSIS Okamoto.

One specimen from Okinawa Island, Loochoo Islands, July 5.

DISTOLEON PARVULUS Okamoto.

One specimen from Okinawa Island, Loochoo Islands, July 5.

This species was described as a *Myrmecæxlorus*, but Okamoto's figure shows that it is a *Distoleon*, in appearance very much like the others. It might be noted that *Feinerus formosanus*, of Navas, is the same as *Formicaleo formosanus* Okam., and both are doubtless the same as *Distoleon dirus*, which is widely spread. I have specimens of *D. dirus* from Foochow, China, as well as from the Malay Peninsula and other localities.

GAMA MATSUOKÆ Okamoto.

Several from Rokki, May 15 and 17; Hori, May 25, June 6. *Gama* is the first synonym of *Creagris*, which is preoccupied.

HAGENOMYIA ASAKURÆ Okamoto.

One from Sozan, June 29; I have others sent by Okamoto. *Hagenomyia brunneipennis* Peters. and *Myrmeleon ochraceopennis* Nakahara appear to be one species, related closely to *H. micans* of Japan proper.

MYRMELEON PUNCTINERVIS sp. nov.

Similar to *M. formicarius* in appearance, but smaller and with much slenderer wings. Color similar, but lateral scars on vertex pale; no median extension of black of face onto clypeus, black extending down at each lateral corner; pronotum with a narrow pale mark on each anterior side, and two small pale spots near middle of front. Wings with most of the cross-veins, especially costals, and those in radial and median areas, and the longitudinal veins in radial area, with pale dots (in *formicarius* mostly wholly dark and the longitudinal veins with pale and dark streaks). Venation denser than in *formicarius*, thus between radius and radial sector there are 18 to 20 cross-veins before stigma and four or five beyond stigma (in *formicarius* ten to twelve before stigma and two beyond). About 45 costals before stigma, nine or ten branches of radial sector. Forewing with a very distinct intercubital vein for a long distance parallel to cubitus, the area between in first part with but one series of cells, farther out two series.

Length, body, 25 mm; forewing, length, 27; width, 5.7.

FORMOSA, Hori, June 15 (*Gressitt*). Type, M. C. Z. No. 20200.

Esben Petersen records a small specimen of *M. formicarius* from Formosa; quite possibly it is this species.

SOGRA NEGLIGENS Navas.

One from Kuraru, May.

HEOCLISIS KAWAII Nakahara.

One from Kuraru, May.

ASCALAPHIDÆ**ACHERON TRUX** Walker.

Many specimens, from various localities, some wholly clear-winged; others are partly or wholly dark.

SUPHALOMITUS FORMOSANUS Petersen.

Two males from Rokki, May 16; also one from Foochow, China (*Kellogg*).

SUHPALASCA FORMOSANA Okamoto.

One specimen from Formosa.

SUHPALASCA UMBROSA Petersen.

One male specimen, Kuraru, May 10, not fully colored; one female from Chirifu, May 19; two females from Hori, June 9; in none are the wings embrowned. A smaller female from Bukai, June 13, may be different; it has less white hair below.

MANTISPIDÆ**EUCLIMACIA BADIA** Okamoto.

Two specimens from Kuraru, August 10 and 11.

Kuwayama compares it to *E. tagalensis*; the latter species differs not only in lacking the pronotal spots, but the posterior part of the pronotum is not as long as in *badia*, the tubercles are smaller, the dark costal streak is much narrowed, and the whole posterior part of the vertex is black.

EUMANTISPA TAIWANENSIS Kuwayama.

One specimen from Bukai, June 11, agrees closely with the description based on one specimen.

MANTISPA ORIENTALIS E. Petersen.

Two specimens from Hassenzan, June 24 and 26.

Three specimens, one each of Petersen, Stitz, and Kuwayama, had the pronotum entirely black; both of mine have a pair of very distinct pale stripes, reaching almost to hind margin; the larger specimen (forewing, 20 mm) is otherwise close to Petersen's description, the smaller specimen (forewing, 14 mm) has a pale stripe each side through the meso- and metanotum. The larger specimen has three branches from the first radial cell in one wing. In both the wings are plainly tinged with

pale yellowish brown, as Petersen noted. This will be the most useful character to determine the species.

MANTISPA FORMOSANA Okamoto.

Several from Rokki, May 13; Chirifu, May 18; and Kusukusu, April 12. The branches of the radial sector vary from three to five and are not always constant in opposite wings, so I think the varieties given by Stitz and Kuwayama are simply synonyms.

MANTISPA TRANSVERSA Stitz.

LOOCHOO ISLANDS, Iriomote Island, August 20 to 25. Several specimens.

This species was based on one specimen, and was unknown to Kuwayama in his revision. In most of these specimens the pale band across the anterior part of pronotum is broken into two rounded spots; the face has the usual black stripe; the antennæ, except the yellow basal joint, are black; scutelli mostly yellow, a yellow transverse mark inward from base of each wing; pleura with two large black marks on both meso- and metapleura. Coxæ and trochanters dark, rest of legs yellowish, except dark on tips of tarsi, and on basal part of hind tibia. Front legs largely yellowish, femora with brown streak inside, fainter outside, tibia with short, sometimes faint, streak outside, wholly brown, except upper edge, on inside.

The veins are all dark; in both wings the anal vein dark (in *formosana* the anal vein pale and inconspicuous). The pronotum is a little heavier than in *formosana*, faintly transversely wrinkled, but not scabrous or hairy as in *formosana*. Thus it belongs in the genus or subgenus *Mantisquilla* as I have modified it. It is similar in thoracic marks to *M. spilonota* of Ceylon, but that species has no black band on the vertex.

Body, length, 8 to 11 mm; forewing, 7.5 to 10.

None of the specimens examined show the slightest sign of stripes on the pronotum; however, I would expect that they do occur.

ILLUSTRATIONS

PLATE 1

- FIG. 1. *Schistoperla collaris* sp. nov.; head and pronotum.
2. *Neoperla klapaleki* sp. nov.; ventral plate.
3. *Togoperla æqualis* sp. nov.; ventral plate.
4. *Schistoperla collaris* sp. nov.; male from below.
5. *Neoperla signatalis* sp. nov.; male genitalia.
6. *Schistoperla collaris* sp. nov.; male from behind.
7. *Schistoperla collaris* sp. nov.; ventral plate.
8. *Togoperla æqualis* sp. nov.; male genitalia.
9. *Neoperla uniformis* sp. nov.; ventral plate.
10. *Tylopyge signata* sp. nov.; male genitalia.
11. *Coniocompsa furcata* sp. nov.; fore and hind wings.

PLATE 2

- FIG. 12. *Peripsocus singularis* sp. nov.; forewing.
13. *Megalomus formosanus* sp. nov.; genitalia.
14. *Psoquilla marginepunctata* Hagen; long-winged form.
15. *Hageniella formosana* sp. nov.; forewing.
16. *Kolbia serialis* sp. nov.; forewing.
17. *Dilar taiwanensis* sp. nov.; forewing, prothoracic lobes, basal part of antenna.
18. *Lepium enderleini* sp. nov.; fore and hind wings.
19. *Hemerobius spinigerus* sp. nov.; genitalia.

PLATE 3

- FIG. 20. *Chrysopa adonis* sp. nov.; venation near divisory cell.
21. *Chrysopa eudora* sp. nov.; venation near divisory cell.
22. *Stenopsocus externus* sp. nov.; forewing.
23. *Cæcilius similis* sp. nov.; forewing.
24. *Chrysopa marcida* sp. nov.; venation near divisory cell.
25. *Stenopsocus tibialis* sp. nov.; forewing.
26. *Paramphientomum nigriceps* sp. nov.; fore and hind wings.
27. *Hemicæcilius transversus* sp. nov.; forewing.
28. *Cæcilius confusus* sp. nov.; forewing.
29. *Chrysopa astur* sp. nov.; venation near divisory cell.
30. *Isophanes decipiens* sp. nov.; forewing.

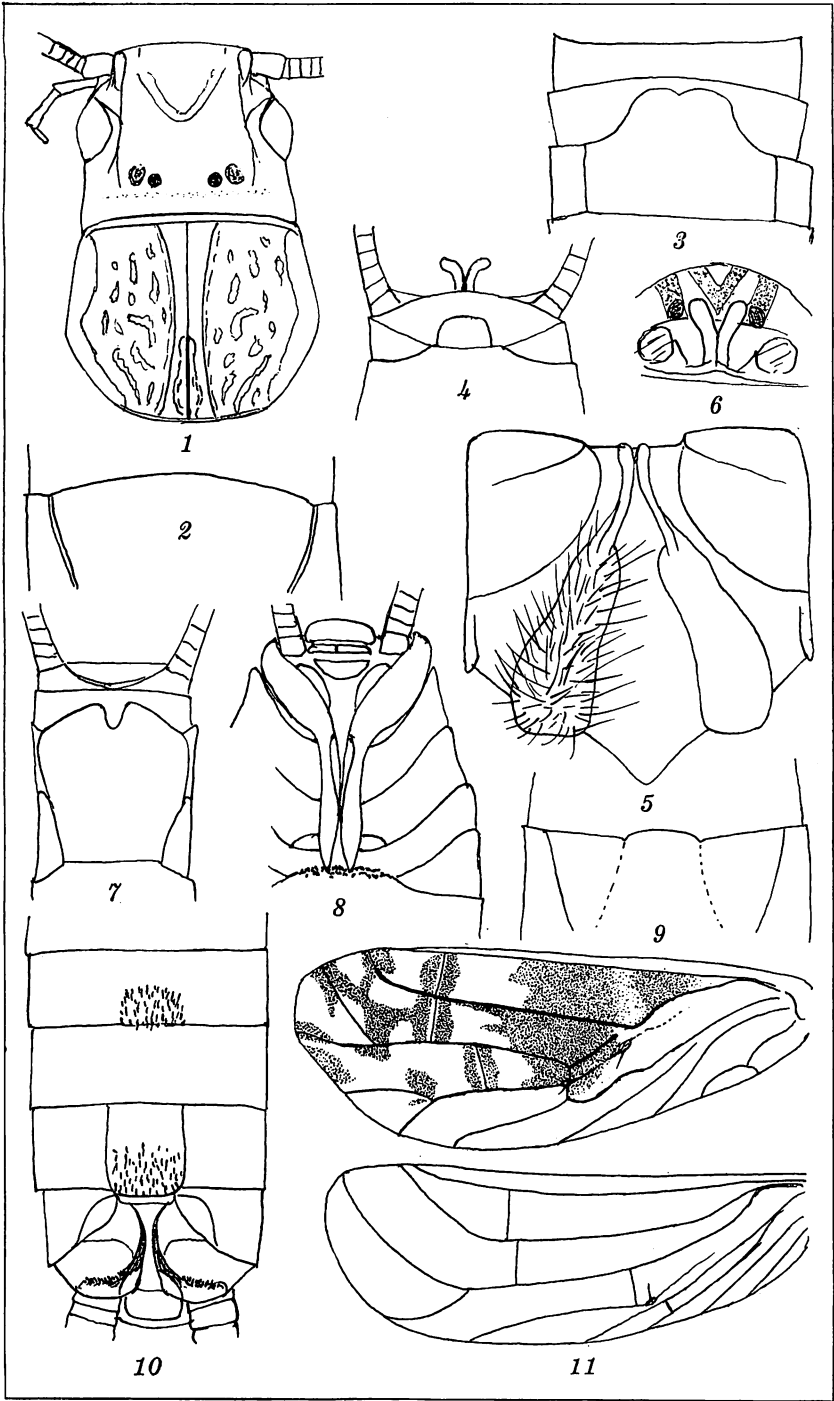


PLATE 1.

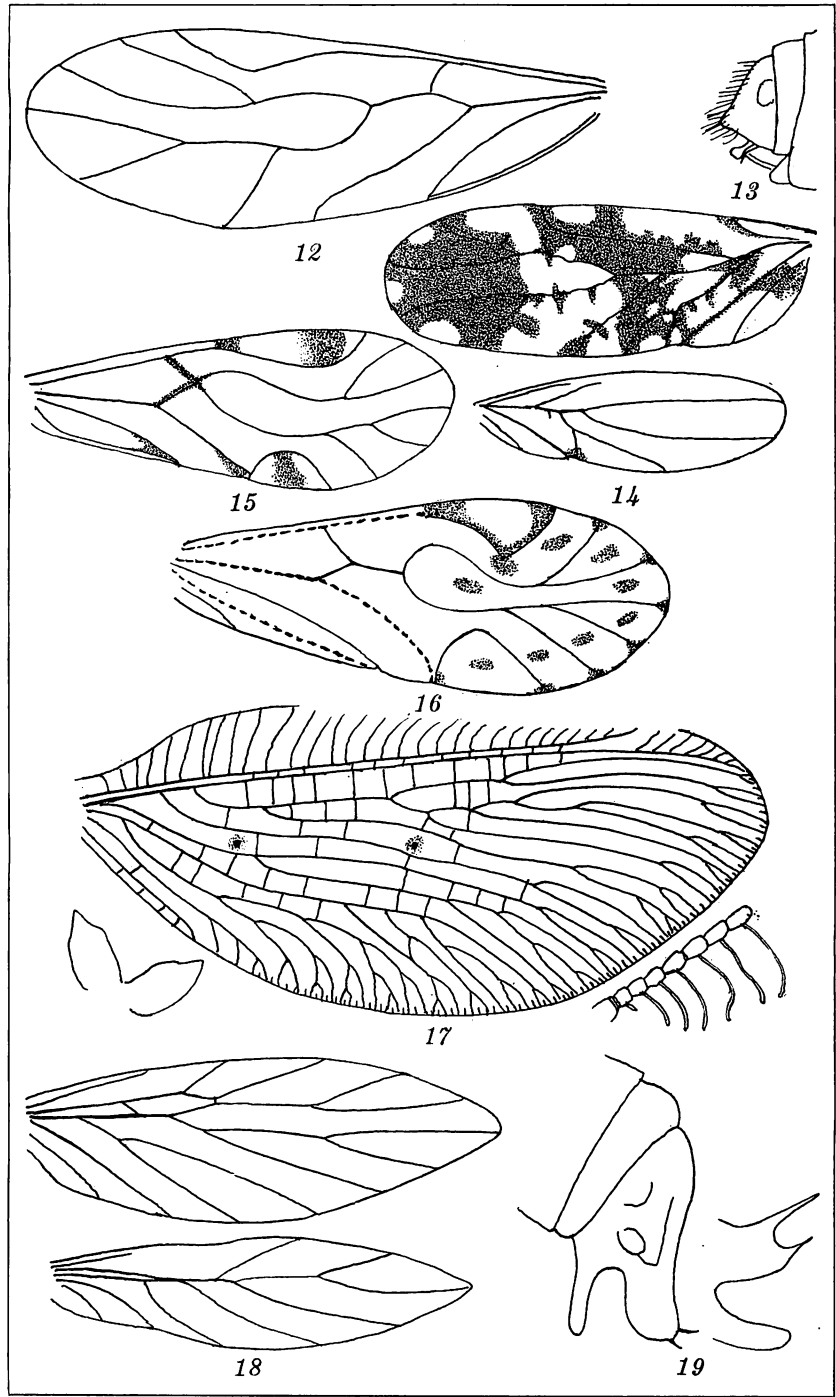


PLATE 2.

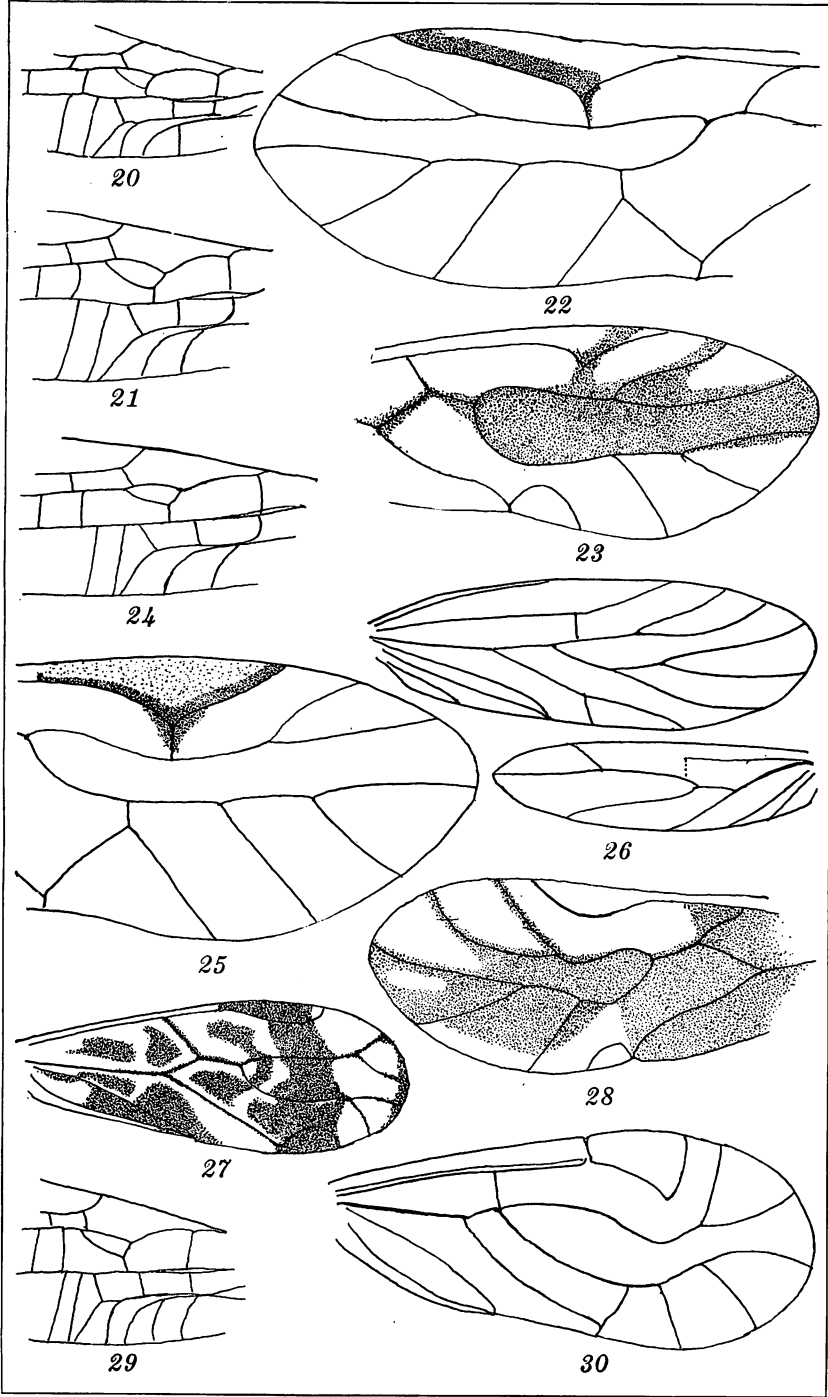


PLATE 3.